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| 10/575,092 | 04/07/2006 | Takashi Arakane | 288835US0PCT | 8650 |
| 22850 | 7590 | 09/19/2008 | | |
| OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314 | | | EXAMINER WILLIAMS, AARON | |
| | | | ART UNIT 2889 | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| | | | |
|----------------------------------------------------|--------------------------------------|---------------------------------------|--|
| <p align="center">Office Action Summary</p> | Application No. 10/575,092 | Applicant(s) ARAKANE ET AL. | |
| | Examiner Aaron Williams | Art Unit 2889 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03/15/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/1/2008, 5/27/2008, 1/04/2007, 11/14/2006,</u> | 6) <input type="checkbox"/> Other: _____ |
| <u>4/07/2006.</u> | |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 10 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claims 10 recites the limitation "**other emitting layer**" in line 3 of claim 10.

There is insufficient antecedent basis for this limitation in the claim.

6. Claims 19 recites the limitation "**other emitting layer**" in line 3 of claim 19.

There is insufficient antecedent basis for this limitation in the claim.

Claim Objections

7. Claims 10 and 19 are objected to because of the following informalities: the term "**other emitting layer**" should be replaced with --another layer--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 2, 5 - 9, 11 – 13 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent Grant Publication 2004/0032214 by Lee et al., herein refer to as Lee.

Regarding claim 1 Lee discloses in figures 1 - 4D, **an organic electroluminescent device comprising in sequence an anode** (Figure 3, refer to paragraph [0028] where discloses an anode (31)), **a first emitting layer** (refer to paragraph [0030] emitting layer (44), tris(8-hydroquinolato) aluminum (Alq3) is the material disclosed by the reference), **a carrier barrier layer** (refer to paragraph [0033] controlling layer (45), 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α -NPD) is the material disclosed by the reference), **a second emitting layer** (refer to paragraph [0030] emitting layer (50), 4,4-bis(2,2-diphenylvinyl)-1,1'-biphenyl (DPVBi) or 4-(dicyanomethylene)-2-t-butyl-6-(1,1,7,7-tetramethyljulolidyl-9-enyl)-4H-pyran (CDJTb) doped Alq3 is the material disclosed by the reference) **and a cathode stacked** (refer to paragraph [0035] cathode (48)); **wherein the ionization potential of the carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1**

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eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting layer by 0.1 eV or more.

The Examiner notes that materials disclosed by the applicant in the specification that have the claimed ionization potentials and affinity levels are anticipated (based on inherency) by the Lee reference thus the claim limitations have been met.

Regarding claim 2 Lee discloses in figures 1 - 4D, **the organic electroluminescent device according to claim 1, wherein the ionization potential of the carrier barrier layer (carrier controlling layer (45)) is more than the ionization potential of the first emitting layer (emitting layer (44)) by 0.2 eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting layer by 0.2 eV or more.** The Examiner notes that materials disclosed by the applicant in the specification that have the claimed ionization potentials and affinity levels are anticipated (based on inherency) by the Lee reference thus the claim limitations have been met.

Regarding claim 5 Lee discloses in figures 1 – 4D, **the organic electroluminescent device according to claim 1, wherein the first emitting layer (light emitting layer (44)) comprises a first dopant for a first emission color and the second emitting layer (light emitting layer (49)) comprises a second dopant for a second emission color.** Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating.

Regarding claim 6 Lee discloses 1 – 4D, **the organic electroluminescent device according to claim 5, wherein at least one carrier barrier layer comprises a third dopant for a third emission color.** The Examiner notes that the one of the a layer, such as a layer of (Alq₃), can have carrier barrier traits which when doped can becoming an emitter layer. This case with Lee's 49 which can be a green emitting layer which is composed of (Alq₃).

Regarding claim 7 Lee discloses 1 - 4D, **the organic electroluminescent device according to claim 6, wherein the first, second and third dopants are selected from blue, green or red.** Refer to paragraph [0030] for the details of the dopant colors.

Regarding claim 8 Lee discloses in figures 1 – 4D, **the organic electroluminescent device according to claim 1, wherein the first emitting layer emits blue or red light.** Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating order.

Regarding claim 9 Lee discloses in figures 1 – 4D, **the organic electroluminescent device according to claim 1, wherein the second emitting layer emits blue or red light.** Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating order.

Regarding claim 11 Lee discloses in figures 1 – 4D, **the organic electroluminescent device according to claim 1, wherein the first emitting layer**

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comprises a hole-transporting material and the second emitting layer comprises an electron-transporting material. The Examiner notes that materials disclosed by the applicant in the specification that have the claimed electron mobility and hole mobility are anticipated by the Lee reference thus the claim limitations have been met.

Regarding claim 12 Lee discloses in figures 1 – 4D, **the organic electroluminescent device according to claim 11, wherein the hole mobility of the first emitting layer is $10^{-5} \text{ cm}^2/\text{vs}$ or more and the electron mobility of the second emitting layer is $10^{-6} \text{ cm}^2/\text{vs}$ or more.** The Examiner notes that materials disclosed by the applicant in the specification that have the claimed electron mobility and hole mobility are anticipated by the Lee reference thus the claim limitations have been met.

Regarding claim 13 Lee discloses in figures 1 – 4D, **the organic electroluminescent device of claim 1 that emits white light.** Refer to paragraph [0035] where Lee describes his device as a white light-emitting organic electroluminescent element.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 3, 4, 14 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Publication 2002-313553 to Omori et al., herein refer to as Omori., and further in view of US Patent 7,022,421 to Thompson et al., herein refer to as Thompson.

Regarding claim 3 Omori discloses in figure 2, **an organic electroluminescent device comprising in sequence an anode** (refer to paragraph [0024] where discloses a transparent anode (1)), **a first emitting layer** (refer to paragraph [0024] 1st luminous layer (4a)), **a first carrier barrier layer** (refer to paragraph [0024] 1st hole barrier layer (5a)), **a second carrier barrier layer** (refer to paragraph [0024] 1st electron barrier layer (3a)), **a second emitting layer** (refer to paragraph [0024] emitting layer (50)) **and a cathode** (refer to paragraph [0024] cathode (48)) **stacked**;

However Omori fails to disclose **wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.1 eV or more.**

Thompson teaches in column 14 lines 30 – 45 the difference of the HOMO energy levels of the electron blocking layer (EBL), which is related to the ionization potential, and any adjacent layer can be 500 meV. Thompson also teaches in column

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13 lines 43 – 57 the difference of the LUMO energy level of the hole blocking layer (HBL), which is related to the electron affinity level, and any adjacent layer can be 500 meV. Thompson provides motivation in column 4 lines 1 - 7 where he states the materials forming the EBL and HBL are compounds that are stable during oxidation and reduction to prevent damage to the organic layer. Thus these materials are preventing degradation to the OLED device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized EBL and HBL in Omori's organic EL device since Thompson teaches that the use of such EBL and HBL material prevents damage of the organic layer. Both the Omori and Thompson are in the same field of endeavor (light emitting devices) and are directed to the same problem sought to be solved (optimizing organic EL devices).

Regarding claim 4 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3**, Thompson further teaches **wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.2 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.2 eV or more**. Thompson teaches in column 14 lines 30 – 45 the difference of the HOMO energy levels of the electron blocking layer (EBL), which is related to the ionization potential, and any adjacent layer can be 500 meV. Thompson also teaches in column 13 lines 43 – 57 the difference of the LUMO energy level of the hole blocking

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layer (HBL), which is related to the electron affinity level, and any adjacent layer can be 500 meV.-

Regarding claim 14 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3**, Thompson further teaches **wherein the first emitting layer comprises a first dopant for a first emission color and the second emitting layer comprises a second dopant for a second emission color.**

In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of two different emission layers.

Regarding claim 15 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 14**, Thompson further teaches **wherein at least one carrier barrier layer comprises a third dopant for a third emission color.** Refer to column 12 lines 50 – 60 where it states that the hole blocking layer can simultaneously serve as an emissive layer.

Regarding claim 16 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 15**, Thompson further teaches **wherein the first, second and third dopants are selected from blue, green or red.** In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green.

Regarding claim 17 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3**, Thompson further teaches **wherein the first emitting layer emits blue or red light**. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green. The reference clearly shows that the first layer will admit red or blue.

Regarding claim 18 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3**, Thompson further teaches **wherein the second emitting layer emits blue or red light**. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green. It would be obvious to one of ordinary skill in the art at the time the invention was made to modify Omori's second emitting layer to emit blue or red.

Regarding claim 19 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3, wherein one of the first emitting layer and the second emitting layer emits blue light, and another layer emits red light**. Even though Thompson or Omori do not specifically disclose two emitting layers emit blue it is a well known technique in the art to increase that blue emitting layers to compensate for the short lifespan of blue emitters.

Regarding claim 20 Omori discloses and Thompson teaches, **the organic electroluminescent device according to claim 3, wherein the first emitting layer comprises a hole-transporting material and the second emitting layer comprises an electron-transporting material.** In column 12 lines 45 - 48 US Patent 6,830,828 which is incorporated by reference which teaches doping of (Alq₃) which is an electron transporting material and doping of (α-NPD) which is a hole transporting material.

13. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Grant Publication 2004/0032214 by Lee et al., herein refer to as Lee..

Regarding claim 10 Lee discloses in figure 1 – 4D, **the organic electroluminescent device according to claim 1, wherein one of the first emitting layer and the second emitting layer emits blue light and another layer emits red light.** Even though Lee does not specifically disclose two emitting layers emit blue it is a well known technique in the art to increase that blue emitting layers to compensate for the short lifespan of blue emitters. There fore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make two emissive layers blue to increase the life span of the device.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent Grant Publication 2005/0006642 to Tung et al..

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Williams whose telephone number is (571) 270-5279. The examiner can normally be reached on Monday thru Friday 7:00 to 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Toan Ton can be reached on (571)272-2303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Toan Ton/
Supervisory Patent Examiner, Art Unit 2889

Aaron Williams/
Examiner, Art Unit 2889

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